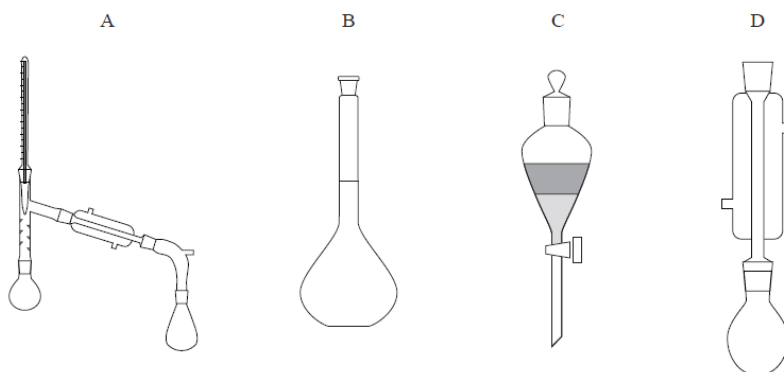


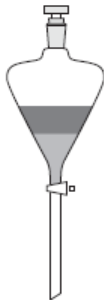
Practical procedures

1) i) Refluxing is often required in reactions involving organic substances. Circle the letter of the apparatus below that would be used in this procedure.

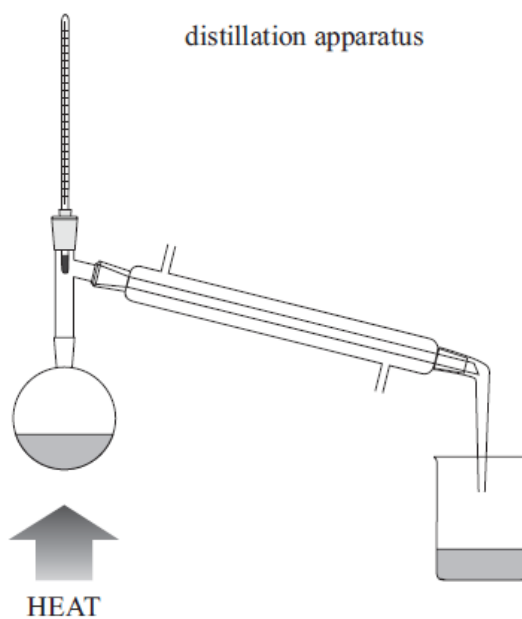


ii) Discuss why refluxing is sometimes used.

2) A description of a laboratory procedure that could be used for the preparation of 2-chloro-2-methylbutane from 2-methylbutan-2-ol, is given in the table below.

INSTRUCTION	APPARATUS
<p>1. Shake 5 mL of 2-methylbutan-2-ol with 20 mL of concentrated HCl in a separating funnel for 10 minutes.</p> <p>2. Run off and discard the acid layer and slowly add sodium hydrogen carbonate solution to the liquid remaining in the separating funnel. Shake the funnel and release the gas frequently.</p> <p>Discard the aqueous layer.</p>	 <p>separating funnel</p>
<p>3. Run the haloalkane into a beaker, and add a few pieces of anhydrous sodium sulfate. Swirl gently.</p>	

4. Decant the haloalkane into a round-bottom flask and distill.



Discuss this procedure by:

(i) explaining why the following reagents are used
concentrated HCl

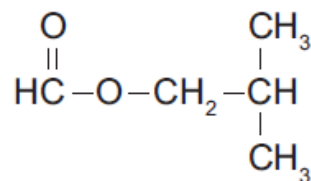
sodium hydrogencarbonate (NaHCO_3)

anhydrous sodium sulfate (Na_2SO_4)

(ii) justifying the use of the apparatus pictured in terms of the properties of the compounds involved
separating funnel

distillation apparatus

3) Esters are often responsible for the flavouring of fruit. The compound below is an ester with a raspberry flavour.



Esters can be prepared by *refluxing* the reactants with a small amount of **concentrated sulfuric acid**. After refluxing, the reaction mixture is treated with **potassium carbonate** and *distilled*. Discuss the preparation of the ester shown above.

Your answer should include:

- an appropriate chemical equation for the formation of the ester
- the reason for using the chemicals stated in bold above
- a discussion of why reflux and distillation are used in this preparation.

4) a) A student thoroughly mixed 20 mL of concentrated hydrochloric acid with 10 mL of 2-methylpropan-2-ol.

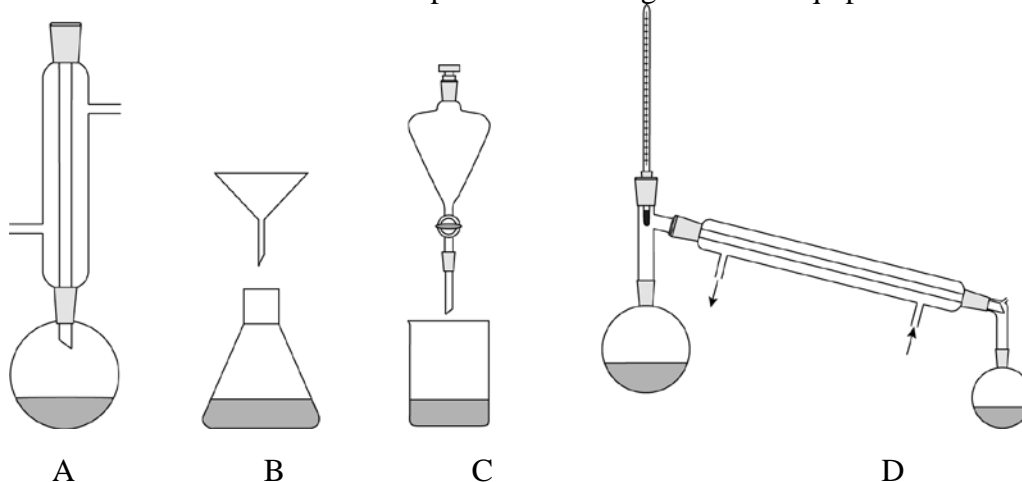
i) Describe any observation that could be made as a result of the reaction occurring.

ii) Draw and name the structure of the organic product.

b) In the preparation, the *impure organic product was initially separated* from the reaction mixture. **Aqueous sodium carbonate** was added to the organic product and when reaction ceased, the *organic product was again separated*. **Anhydrous magnesium sulfate** was added to the organic product, which was then transferred to a flask and *purified by distillation*.

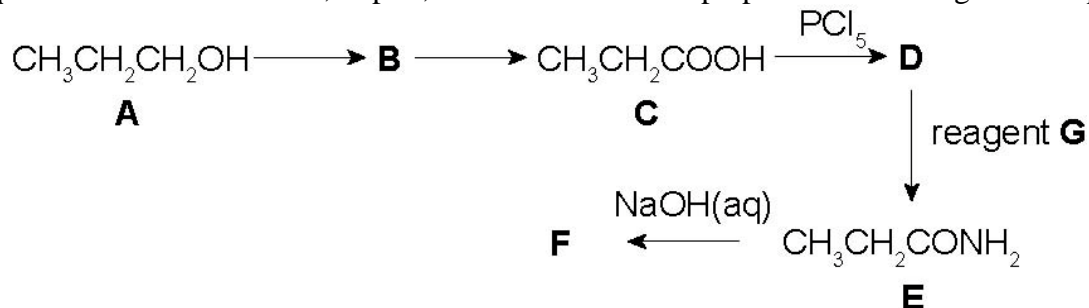
i) Explain why each of the substances identified in **bold** above was added.

ii) The diagrams below show four different experimental arrangements of equipment.



Using one or more of the sets of apparatus shown, discuss how each of the separation processes, identified in *italics* above, is carried out.

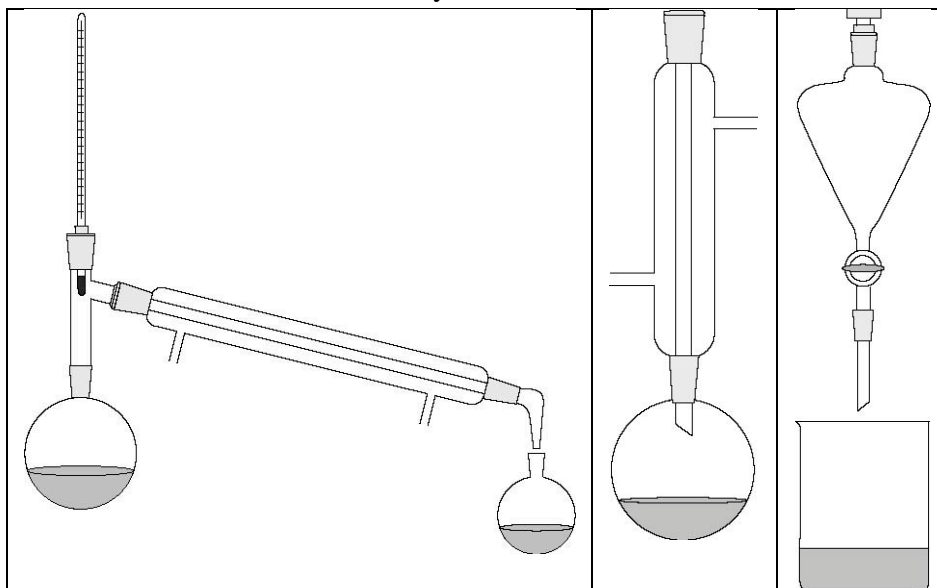
5) The sequence below summarises, in part, the reactions for the preparation of an organic compound, F.



a) Draw and name the structure of an **ester** molecule that is a structural isomer of compound C above.

b) Compound A can be directly converted to compound C by adding an oxidising agent and heating the mixture under reflux.

- Identify an appropriate oxidising agent, and
- select one of the diagrams below and use it to explain (in the space below) how the process of reflux works, and why the reaction is carried out this way.



c) The conversion of compound A into compound C initially involves formation of compound B.

i) Draw the structural formula of compound B and name it.

ii) Describe how the conditions in part (b) could be modified to produce compound B rather than compound C as the major product. Give reasons for these modifications.

d) Compound **C** is reacted with PCl_5 under anhydrous conditions to form compound **D**.

i) Draw the structural formula of compound **D** and name it.

ii) What is meant by ‘anhydrous conditions’ and explain why such conditions are necessary for this reaction.

e) i) Name compound **E**.

ii) Identify reagent **G**.

f) Compound **E** can be hydrolysed by reaction with aqueous sodium hydroxide. Name the products of this hydrolysis reaction and draw the structural formula for each.